

INPATIENT ^{131}I THERAPY FOR ABLATION OF RESIDUAL THYROID OR METASTATIC DISEASE

PRINCIPLE

The purpose of a ^{131}I Thyroid Therapy is to ablate postoperative thyroid remnants after thyroidectomy as well as treating residual thyroid cancer and metastatic disease after partial or complete thyroidectomy. Doses $>30\text{mCi}$ cause destruction of the thyroid by the Beta particles causing ionization and chromosomal damage. Therefore, the cells cannot replicate.

INDICATIONS

1. Thyroid Cancer
 - a) ^{131}I therapy has been used for postoperative ablation of thyroid remnants after thyroidectomy.
 - b) ^{131}I therapy has been used to treat residual thyroid cancer and metastatic disease after partial or complete thyroidectomy.
2. Benign Thyroid conditions (obstructive goiter, etc.)

CONTRAINDICATIONS

1. Pregnancy. A negative serum beta HCG pregnancy test must be documented in the patient's chart for all females under 50 years of age treated therapeutically with radiopharmaceuticals. The pregnancy test must be within one week of the ^{131}I Therapy. A pregnancy test is not necessary if the patient has had a bilateral tubal ligation or hysterectomy.

RADIOPHARMACEUTICAL AND DOSE

30mCi-250mCi of Sodium Iodide ^{131}I administered orally in capsule form or liquid form as prescribed by physician.

REAGENT PREPARATION

Sodium Iodide ^{131}I is received in capsule and liquid form from a commercial pharmacy.

ADVERSE REACTIONS

Although rare, reactions associated with the administration of Sodium Iodide isotopes for diagnostic use include chills, nausea, vomiting, pruritus, hives/urticaria, chest pain, tightness or heaviness, tachycardia, headache, dizziness.

RADIATION DOSIMETRY

Sodium Iodide ¹³¹I

Characteristic emission: 69.4 Avg. keV Beta-1
96.6 Avg. keV Beta-3
191.6 Avg. keV Beta-4
284.3 keV Gamma-7
364.5 keV Gamma-14
637.0 keV Gamma-17

Half life: 8.04 days

The estimated absorbed radiation doses to an average (70kg) euthyroid (normal functioning thyroid) patient from an oral dose of iodine I 131 in rads per millicurie with a 25% uptake are shown below.

Thyroid	1300 rads/mCi
Stomach wall	1.4 rads/mCi
Red marrow	0.26 rads/mCi
Liver	0.48 rads/mCi
Testes	0.088 rads/mCi
Ovaries	0.14 rads/mCi
Total body	0.71 rads/mCi

PATIENT PREPARATION

1. Recent TSH, pathology and operative reports must be available prior to treatment.
2. The patient is encouraged to drink liquids on day before, day of, and following treatment.
3. No solid food for 2 hours before treatment.
4. The patient must not eat solid foods for 2 hours after ingestion of Sodium Iodide ¹³¹I solution/capsule.
5. Patient is instructed to bring a copy of current medications and allergies.

TECHNICAL NOTES

1. When administering ¹³¹I Sodium Iodide solution of 10mCi's or greater, the technologist must perform a Pre-administration bioassay of his/her neck and fill out the appropriate form. Then 24-72 hours after dosing the patient perform a Post-administration bioassay of his/her neck, complete the appropriate form, and submit to the Nuclear Medicine Manager

131 IODINE THERAPY FORM INSTRUCTIONS

PROCEDURE

1. The patient is to be assigned a private room on 6B.
2. Inform the radiation safety officer (RSO) of the patient's name, room number, radioactivity and dose.
3. Pre-admission patient room preparation is done by the nuclear medicine technologist.
 - a) Use a leak-proof absorbent paper to cover large areas that are likely to be contaminated.(ie. Floor pathway from around bed to bathroom/toilet/shower) Small items may be covered with absorbent paper or plastic bags such as telephone, toilet seat and handle, sink hot/cold water handles, television, bedrails, call bell, handle to drawers, light pullstring, and patient's chair.
 - b) Place a visitors chair as far away from the patient's bed as possible or at least one meter from the patients bed.
4. Obtain biohazard medical waste containers from environmental services. Place two containers in the patient's room, one labeled "LINEN" and the other labeled "TRASH". Place two clear bags (doubled) inside each container.
5. Attach the lab kit to the wall in the patient's room. This contains "Caution Radioactive Material" labels, instructions for handling radioactive laboratory specimens, and zip-lock bags for the specimens.
6. Radioactive warning signs must be placed on the door to the patient's room and on the patient's chart.
7. Place the nursing instructions form in the front of the patient's chart.
8. If the ^{131}I dose is in the form of liquid solution, the technologist who administers the ^{131}I dose must do a pre-administration count of his/her neck (bioassay). A post-administration count must be performed between 24 and 72 hours after administering the dose. A pre- and post- burden determination form must be completed and given to the chief technologist.
9. Have the patient's physician write orders for the patient. If lab work is needed, have blood drawn before ^{131}I administration.
10. The technologist assays the therapy dose and forwards assay amount to the nuclear medicine physician.
11. Nuclear medicine physician prepares post-therapy patient instructions using ^{131}I Outpatient Release worksheet and prints 2 copies.
12. The nuclear medicine physician (Authorized User) will write the written directive for treatment.

13. The authorized user will explain the therapy to the patient along with radiation safety guidelines, and give instructions to patient. The patient will sign the consent form and confirmation copy of post-discharge instructions.
14. Brief the patient on radiation safety procedures for dosage administration, visitor control and radioactive waste. Please instruct the patient to discard uneaten food and drink (except hard objects such as chicken bones) by flushing it down the toilet.
15. Instruct all visitors to leave the patient's room before administering the dose.
16. The technologist will prepare and measure the dose. The dose will be delivered on a cart to the patient's room.
17. Administer the dose to the patient under the direct supervision of the Nuclear Medicine Physician .
18. Following administration of the dose, measure the exposure rate in mR/hr at 1.0m and 0.3m from patient using meter stick held horizontally from patient's xiphoid. Also measure exposure rate at visitor's chair, entrance to the patient's room and wall surface in the adjacent patients room and record readings. Daily radiation surveys are to be done in the morning until patient is discharged. A radiation survey of the patient's room after clean-up is to be done to ensure contamination levels are below acceptable limits.
19. The term "adjacent room" used in the External Radiation Intensity Measurements section of the survey form refers to adjacent patient room, visitors' areas, and staff work areas. If the measured dose rate in any of these areas exceeds either 2.0 mR/hr or 100 mRem/yr, then it is necessary to contact the RSO immediately for corrective action.
20. Return the radioactive therapy container to Nuclear Medicine for decay.
21. Immediately following the ^{131}I administration and for the next few days, monitor the patient and their surroundings. Record readings daily on the Radiation Survey Report form.
22. Calculate the remaining dose after each measurement utilizing the formula on the patient discharge data form.
23. Report to authorized user.
24. When it has been determined that the patient can be discharged, the authorized user will coordinate the discharge with the patient's physician. **BE SURE TO HAVE NUCLEAR MEDICINE SUPERVISOR CHECK YOUR PAPERWORK BEFORE THE PATIENT IS DISCHARGED.**

INSTRUCTIONS FOR HANDLING RADIOACTIVE WASTE

1. All trash and linens are to be placed in plastic bag-lined cardboard “Infectious Waste” boxes. These are found on the nursing floors or can be obtained from Environmental Services personnel.
2. Use only large clear plastic housekeeping trash bags to line the boxes. Red Biohazard bags should not be used unless the patient’s condition demands it (a situation quite infrequent for these patients).
3. The labeling procedure for the boxes will remain the same, namely, each box is Labeled TRASH or LINEN and only removable stick-on-labels will be used as radiation warning signs; Do not write ^{131}I , radioactive trash, etc., directly on the box.
4. Do not overfill any box – start a new one.
5. No loose bags are to be brought to the storage area, everything must be in boxes to facilitate storage and handling.
6. When placing boxes in the storage area, stack them neatly with the dated labels facing out.
7. Be sure to enter each box in the log book located in the storage area.
8. Any questions, contact Joe Solge (623-3822) or Cindy Knotts (733-4563) for assistance.
9. If the storage area is blocked, contact the Environmental Services supervisor at X3868.

POST-DISCHARGE ROOM SURVEY

1. Before the patient room can be released for unrestricted use, it must be determined that there is no removable surface contamination in excess of 200 dpm ^{131}I /100sq cm.
2. Conversion of net cpm to dpm can be done by the conversion factor posted in the hot lab.
3. Fill in the Post-Discharge Room Survey form. This form must be signed by the Nuclear Medicine supervisor, or Lead Nuclear Medicine technologist if a weekend, prior to releasing the room to nursing.
4. Notify nursing immediately when room is released. Nursing staff will then call Environmental Services to clean the room.
5. Copies of all the documents for this patient will be sent to the Nuclear Medicine supervisor and RSO immediately after completion.

¹³¹I THERAPY SURVEY/ DISCHARGE WORKSHEET

Patient Name: _____ Room No.: _____

MRN: _____ Date/Time of Administration: _____

Dose Administered: _____ Technologist Administering Dose: _____

EXTERNAL RADIATION MEASUREMENTS

If any dose rate measured outside of the patient's room exceeds 2.0mR/hr or will result in a dose of 50 millirems per hospital admission to a patient in the adjacent room, then contact the Radiation Safety officer for corrective action.

LOCATION	Date_____ Time_____ Initial_____ mR/hr	Date_____ Time_____ Initial_____ mR/hr	Date_____ Time_____ Initial_____ mR/hr	Date_____ Time_____ Initial_____ mR/hr	Date_____ Time_____ Initial_____ mR/hr
0.3m from patient (@ xiphoid level)					
1.0 m from patient (@ xiphoid level)					
Visitor's Chair					
Entry door to patient's room					
wall surface (adjacent patient room)					
wall surface (stairwell/hallway)					
GM Survey Meter used/Serial No.					

Nuclear Medicine Supervisor: _____

Radiation Safety Officer: _____

¹³¹I THERAPY PATIENT DISCHARGE DATA

Patient Name: _____ Date: _____

MRN: _____ Discharge rate at one meter(mR/hr): _____

Technologist making dose determination _____ Location _____

Enter Initial and daily 1m patient survey readings into Table below. Calculate and enter dose fraction remaining and residual activity using the following equations:

$$\text{Dose fraction remaining Time}_x = \frac{\text{Dose rate @ 1m at Time}_x}{\text{Dose rate @ 1m at administration of } ^{131}\text{I}}$$

$$\text{Remaining Activity} = \text{Administered activity} \times \text{Dose fraction remaining}$$

Reading	Immediate	Day 1	Day 2	Day 3	Day 4
Date					
Time					
Dose Administered					
mr/Hr @ 1m					
Fraction remaining	1.000				
Remaining activity					
Technologist Initials					

Dose Remaining(mCi) at Discharge: _____

Nuclear Medicine Supervisor _____

Date _____

Please use the chart on the next page to report the results of your post discharge room survey. This completed form must be signed by the Supervisor of the Nuclear Medicine Department (or Lead Tech) before patient is discharged.

Nuclear Medicine Supervisor: _____

Joseph Solge, RSO: _____ Date: _____

¹³¹I THERAPY POST-DISCHARGE ROOM SURVEY

¹³¹I conversion factor from well counter used to count wipes can be found in the Hot Lab at Christiana Hospital. The action level is 200 dpm. Survey the patient's room for removable contamination. The room must not be reassigned until removable contamination is less than 200 dpm¹³¹I /100 cm².

PROCEDURE

1. Obtain a background reading by inserting a test tube containing a blank wipe (2x2 alcohol pad) into the well counter and count for 10 minutes. Record reading.
2. Use a 2x2 alcohol pad to wipe a 10x10cm area of each location listed in Table below.
3. Count each wipe for 3 minutes. Record Gross cpm for each wipe.
4. Determine NET CPM for each wipe by subtracting BKG CPM from GROSS CPM and record.
5. Determine the NET DPM for each wipe using the efficiency conversion factor (ECF) posted in the Hot Lab and record reading for each*.
6. Determine the pre and post decontamination level by dividing the action level in dpm by 100 cm sq. for each wipe and record reading.

*Convert the net cpm to dpm using the well counter efficiency factor at Christiana Hospital in the following equation:

$$\text{Wipe Activity (dpm)} = \text{NET CPM} \times \text{ECF (Efficiency Conversion Factor)}$$

Location	NET WIPE CPM	NET BKG CPM	NET CPM	NET DPM = (Net cpm x ECF)	Pre-decontamination Activity level Dpm/100 cm sq	Post-decontamination Activity level Dpm/100 cm sq
Toilet seat						
Telephone						
Table top						
Patient chair						
Inside door handle patients room						

Technologist signature

Printed Name

Date

This completed form must be signed by the supervisor of the Nuclear Medicine Department before patient discharge.

Nuclear Medicine Supervisor Signature: _____
Joseph Solge, RSO: _____ Date: _____

131 IODINE THYROID BURDEN DETERMINATION REPORT
PRE/POST THERAPY FORM (24 - 72 HOURS)

Technologist's Name: _____ Dose Administered _____
(Print name)

1. Use the NaI probe located at Christiana Hospital. Complete all calculations before submitting this report.

2. On the Biodex probe, use #2 Employee Bioassay. Follow Biodex Calibration and procedures book to monitor thyroid.

3. Take 10-minute background count.

PRE BIOASSAY (BKG)

DATE: _____

Total counts: _____

Bkg cpm (net cpm): _____

POST BIOASSAY (BKG)

DATE: (24 -72 HRS) _____

Total counts: _____

Bkg cpm (net cpm): _____

4. Place anterior portion of neck as close as possible to the detector and count the thyroid for 5 minutes.

PRE BIOASSAY (NECK)

DATE: _____

Total counts: _____

Neck cpm: _____

Net cpm: _____

(Net cpm = Neck cpm - Bkg cpm)

POST BIOASSAY (NECK)

DATE: (24-72 HRS) _____

Total counts: _____

Neck cpm: _____

Net cpm: _____

(Net cpm = Neck cpm - Bkg cpm)

5. Multiply the **Net cpm** in the technologist's thyroid by the conversion factor below to obtain activity in microcuries.

Conversion Factor (CF) _____ uCi/cpm

Activity in thyroid is less than:

PRE BIOASSAY

____ 0.01 ____ 0.02
____ 0.03 ____ 0.04

POST BIOASSAY

____ 0.01 ____ 0.02
____ 0.03 ____ 0.04

6. If the value in #5 exceeds 0.04 uCi, then contact the Chief Technologist and the Radiation Safety Officer immediately.

Technologist's Signature: _____ Date: _____

RSO or Nuclear Medicine Manager: _____ Date: _____

CCHS
NUCLEAR MEDICINE
QUALITY ASSURANCE

Patient Name _____ Date _____

Admitted to Room # _____ MR# _____

¹³¹I Administered:

Amount: _____ Technologist: _____

Date: _____ Time: _____

¹³¹I Remaining:

Amount: _____ Date: _____

Patient monitored by: _____

Discharged by: _____ Date: _____

Radiation room survey performed by: _____ Date: _____

Nuclear Medicine supervisor signature: _____ Date: _____

NURSING INSTRUCTIONS FOR PATIENTS RECEIVING
THERAPEUTIC DOSES OF IODINE 131

Patient Name: _____

The above named patient was administered _____ mCi of Iodine 131 on
_____ at _____ AM / PM

Attending Physician _____

NURSING STAFF

DO NOT permit a therapy patient to be discharged until the monitoring is completed and verified with the technologist's signature (See "patient monitored by").

DO NOT permit a therapy patient's room to be released for cleaning until the monitoring has been completed and documented with the technologist's signature (See "radiation room survey performed by").

Any questions call Nuclear Medicine at 733-1533 or Joseph Solge, RSO at 623-3822.

GENERAL

1. Nurses may spend whatever time is necessary near the patient for ordinary nursing care unless restrictions have been established by the Radiation Safety Office. During the first 24 hours, private duty nurses remaining in the patient's room should stay 2 meters (6 ft.) away from the bed except during actual nursing procedures.

No bed baths should be performed by attendants during the first 48 hours post administration time.

2. Patients are allowed visitors in accordance with usual hospital rules unless other instructions are given by the Radiation Safety Office. However, the first few days visitors should sit at least 1 meter (3 ft.) away from the bed.
3. Pregnant personnel SHALL NOT be assigned to work with this patient.
4. When the patient is discharged, room will be surveyed for contamination and patient monitored before room is released for routine cleaning and reoccupation.
5. A separate bedpan or urinal should be kept for patient use until he/she is discharged. It should be washed thoroughly with soap and hot water, gloves being worn during the procedure. After the patient is discharged, it should be monitored by Nuclear Medicine personnel before being discarded. If bathroom privileges are allowed, the toilet is to be flushed twice after each use.

6. Vomiting within 24 hours after oral administration, urinary incontinence, or excessive perspiration within the first 48 hours, may result in serious contamination of linens or even of the floor. In any such emergency, or if urine is spilled during the collection, **CALL THE NUCLEAR MEDICINE LABORATORY**, Extension 1533 or Radiation Safety Office 623-3822. In the meantime, handle all contaminated material with gloves.
7. The Patient who has received a therapeutic administration of iodine 131 may contaminate his food dishes and utensils with salivary excretion. Hence, he should have disposable articles.

Nursing Instructions for Handling Laboratory Specimens Taken from Patients Receiving Radionuclide Therapy

1. Any lab specimen taken from a patient receiving radionuclide therapy must first be labeled with the appropriate patient identification. In addition to that a radiation warning label must also be attached to the specimen container and to the lab requisition. A copy of the lab instructions must also be attached to the requisition. Finally, the specimen container must be placed in a zip-lock type plastic bag for transport to the laboratory. **CALL THE RECEIVING LABORATORY TO ALERT THEM THAT A RADIOACTIVE SPECIMEN IS COMING. A RUNNER MUST TAKE THE SPECIMEN DIRECTLY TO THE LABORATORY.**
2. Radiation warning labels, lab instructions, and zip-lock bags may be found in the LAB KIT placed in the patient's room by the technologist handling the therapy dose administration. **THIS KIT MUST STAY IN THE PATIENT'S ROOM AT ALL TIMES!!!!**
3. After all specimen handling and identification procedures have been completed, you must inform The Nuclear Medicine Department (733-1533) and The Radiation Safety Officer, Joe Solge, (623-3822) that a radioactive specimen has been sent to the laboratory.

Instructions for Handling Radioactive Laboratory Specimens

1. Universal precautions should be utilized when handling such specimens.
2. The specimen should be handled by the minimum number of people for the minimum amount of time.
3. Specimen testing should be performed under a hood if possible.
4. All material that has been in contact with the specimen during the procedure must be double-bagged in plastic bags, along with the resealed remainder of the specimen, and returned to The Nuclear Medicine Department (First floor at Christiana, 733-1533), for proper disposal.
5. Material to be sent with the specimen can include pipettes, pipette tips, test tubes, gauze sponges, absorbent pads, etc.
- 6 . The bag must be labeled with the patient's name, date, and radioactive warning label before being removed from the laboratory.

COMMITTEE APPROVAL:

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REFERENCES

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